SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F21-R-41

Name: Brush Lake **County**: Brookings
Legal Description: T110N-R52W-Sec. 3, 9, 10, 11
Location from nearest town: 2 miles south, ½ mile east of Arlington, SD

Dates of present survey: July 2-3, 2008
Date last surveyed: July 5-6, 2006

Primary Game and Forage Species	Secondary and Other Species
Walleye	Northern Pike
Yellow Perch	Black Bullhead
	Green Sunfish
	White Sucker

PHYSICAL DATA

Surface Area: 386 acres **Watershed area**: Unknown
Maximum depth: Unknown **Mean depth**: Unknown
Contour map available: No **Date mapped**: NA
Beneficial use classifications: (9) fish and wildlife propagation, recreation and stock watering.

Ownership of lake and adjacent lakeshore properties:

Brush Lake was so named because of the abundance of brush found along its shorelines. It is listed as a meandered lake in the State of South Dakota Listing of Meandered Lakes and the fishery is managed by the South Dakota Department of Game, Fish, and Parks (GFP). Most of the east and south shoreline is owned by the United States Fish and Wildlife Service. The north shore is considered a public right-of-way for US Highway 14. The remainder of the shoreline is privately owned.

Fishing Access:

There is a grassy shoreline on the south shore of the lake where small boats can be launched with difficulty. There are several areas suitable for shore fishing on the public properties described above.

Field Observations of Water Quality and Aquatic Vegetation:

Water quality during the survey was good with a Secchi depth measurement of 120 cm (47 in) although some areas of the lake had visible densities of green and blue-green algae. Dense beds of sago pondweed (*Potamageton pectinatus*), clasping leaf pondweed (*Potamageton richardsonii*) and northern water milfoil (*Myriophyllum verticillatum*) were observed around the entire shoreline and cattail was observed in several of the shallow bays.

BIOLOGICAL DATA

Methods:

Brush Lake was sampled on July 2-3, 2008 with three overnight gill-net sets and four overnight trap-net sets. The trap nets are constructed with 19-mm-bar-mesh (¾ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. The gill nets are 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh (½, ¾, 1, 1¼, 1½, and 2 in) monofilament netting. Sampling sites are displayed in Figure 4.

Results and Discussion:

Gill Net Catch

Yellow perch comprised 60.3% of the gill net sample followed by walleye at 37.7% (Table 1). Black bullhead was the only other species caught.

Table 1. Total catch from three overnight gill net sets at Brush Lake, Brookings County, July 2-3, 2008.

Species	Number	Percent	CPUE[1]	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Yellow Perch	88	60.3	29.3	±8.4	23.8	4	2	94
Walleye	55	37.7	18.3	±4.3	31.9	14	0	95
Black Bullhead	3	2.1	1.0	±0.7	72.1	--	--	--

* Four years (2000, 2002, 2004, 2006).

Trap Net Catch

Black bullheads made up 71.4% of the trap net sample followed by walleye, white sucker, northern pike, and green sunfish (Table 2).

Table 2. Total catch from four overnight trap net sets at Brush Lake, Brookings County, July 2-3, 2008.

Species	No.	%	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Bullhead	55	71.4	13.8	±5.7	272.8	42	13	97
Walleye	11	14.3	2.8	±1.1	2.3	80	40	92
White Sucker	7	9.1	1.8	±1.8	1.0	--	--	--
Northern Pike	2	2.6	0.5	±0.6	3.8	--	--	--
Green Sunfish	2	2.6	0.5	±0.6	0.1	--	--	--

* Four years (1996, 2000, 2004, 2006)

[1] See Appendix A for definitions of CPUE, PSD, RSD-P and mean Wr.

Walleye

Management objective: Maintain a walleye fishery with a gill-net CPUE of at least 15, PSD range of 30-60 and RSD-P of 10-20.

The majority of walleyes sampled this year were 33-38 cm (13-15 in) long (Figure 1) and were most likely stocked in 2005 (Table 7). Although no aging structures were collected, the increase in length of 2005 fish over the last 2 years and high Wr values suggest good growth.

Table 3. Walleye gill-net CPUE, PSD, RSD-P, and mean Wr for Brush Lake, Brookings County, 1999-2008.

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Mean*
CPUE		15.7		13.0		6.0		92.7		18.3	31.9
PSD		37		97		50		18		14	51
RSD-P		0		0		33		1		0	9
Mean Wr		82		105		91		98		95	94

*Four years (2000, 2002, 2004, 2006)

Yellow Perch

Management objective: Maintain a yellow perch population with a gill-net CPUE of at least 50 with a PSD range of 30-60.

Yellow perch CPUE increased in 2008 (Table 4) due to a large year class of fish produced naturally in 2007 (Figure 2). Sporadic natural reproduction since 2002 has resulted in low gill net catches compared to the late 90's and early 2000's when several stockings of adult and juvenile perch were made (Table 4).

Table 4. Yellow perch gill-net CPUE, PSD, RSD-P, and mean Wr for Brush Lake, Brookings County, 1999-2008.

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Mean*
CPUE		33.3		54.7		3.7		3.3		29.3	23.8
PSD		28		49		45		30		4	38
RSD-P		1		6		0		30		2	9
Mean Wr		100		95		100		97		94	98

*Four years (2000, 2002, 2004, 2006)

Black Bullhead

Management objective: Maintain a black bullhead population with a trap-net net CPUE of less than 100.

Black bullhead trap-net CPUE decreased in 2008 (Table 5) and the fish sampled ranged in length from 17 to 40 cm (6.7 to 15.7 in) (Figure 3). There seems to be a weak correlation between walleye abundance and bullhead abundance over the last ten years (Table 3, Table 5). Bullhead abundance increased in 2006 after walleye abundance reached a ten-year low in 2004.

Table 5. Black bullhead trap-net CPUE, PSD, RSD-P and mean Wr for Brush Lake, Brookings County, 1999-2008.

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
CPUE		703.0				14.2		208.2		13.8
PSD		12				19		1		42
RSD-P		0				17		1		13
Mean Wr		--				93		90		97

All Species

Brush Lake contains good numbers of game fish and very few undesirable fish. No carp or buffalo have ever been sampled in the lake (Table 6).

Table 6. Gill-net (GN) and trap-net (TN) CPUE for all fish species sampled in Brush Lake, Brookings County, 1999-2008.

Species	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
WHS (GN)		--		--		1.0		1.3		--
WHS (TN)		--		--		0.2		0.8		1.8
BLB (GN)		167		93.7		2.7		25.0		1.0
BLB (TN)		703		--		14.2		208.2		13.8
YEB (GN)		--		--		--		2.0		--
YEB (TN)		--		--		--		0.8		--
NOP (GN)		2.0		6.3		2.7		1.3		--
NOP (TN)		1.0		--		1.8		3.0		0.5
GSF (GN)		--		--		--		--		--
GSF (TN)		0.2		--		--		0.2		0.5
YEP (GN)		33.3		54.7		3.7		3.3		29.3
YEP (TN)		5.0		--		--		0.8		--
WAE (GN)		15.7		13.0		6.0		92.7		18.3
WAE (TN)		1.4		--		2.0		6.0		2.8

WHS (White Sucker), BLB (Black Bullhead), YEB (Yellow Bullhead), NOP (Northern Pike), GSF (Green Sunfish), YEP (Yellow Perch), WAE (Walleye).

MANAGEMENT RECOMMENDATIONS

1. Stock walleye fingerlings at a rate of 100/acre as needed to maintain a viable fishery.

2. Stock yellow perch adults at a rate of 10/acre as needed to accomplish and maintain the management objective.

3. Evaluate all management activities by conducting lake surveys every other year.

4. Investigate the possibility of establishing a simple boating access area on the south end of lake.

5. Include the areas connected by culverts in future fish stocking and other management activities.

Table 7. Stocking record for Brush Lake, Brookings County, 1990-2008.

Year	Number	Species	Size
1992	130,000	Northern Pike	Fry
	827	Northern Pike	Adult
1997	3,280	Yellow Perch	Adult
1998	40,000	Walleye	Fingerling
	2,025	Yellow Perch	Adult
1999	30,000	Walleye	Fingerling
2001	4,572	Yellow Perch	Adult
2002	31,140	Walleye	Fingerling
	14,896	Yellow Perch	Juvenile
2004	44,400	Walleye	Fingerling
2005	38,600	Walleye	Fingerling
2006	40,220	Walleye	Fingerling
	435	Yellow Perch	Adult

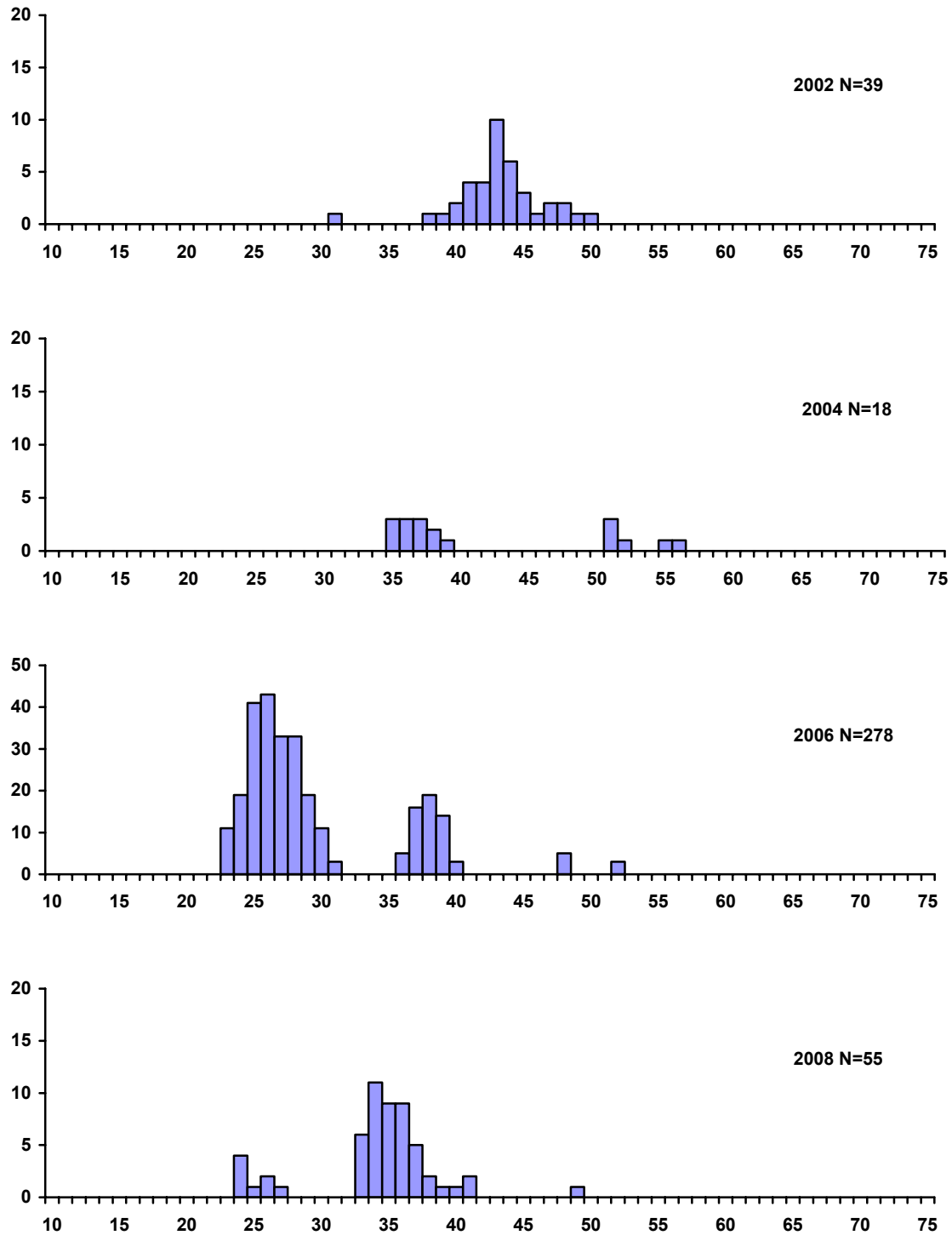


Figure1. Length frequency histograms of walleye from Brush Lake, Brookings County, 2002, 2004, 2006 and 2008.

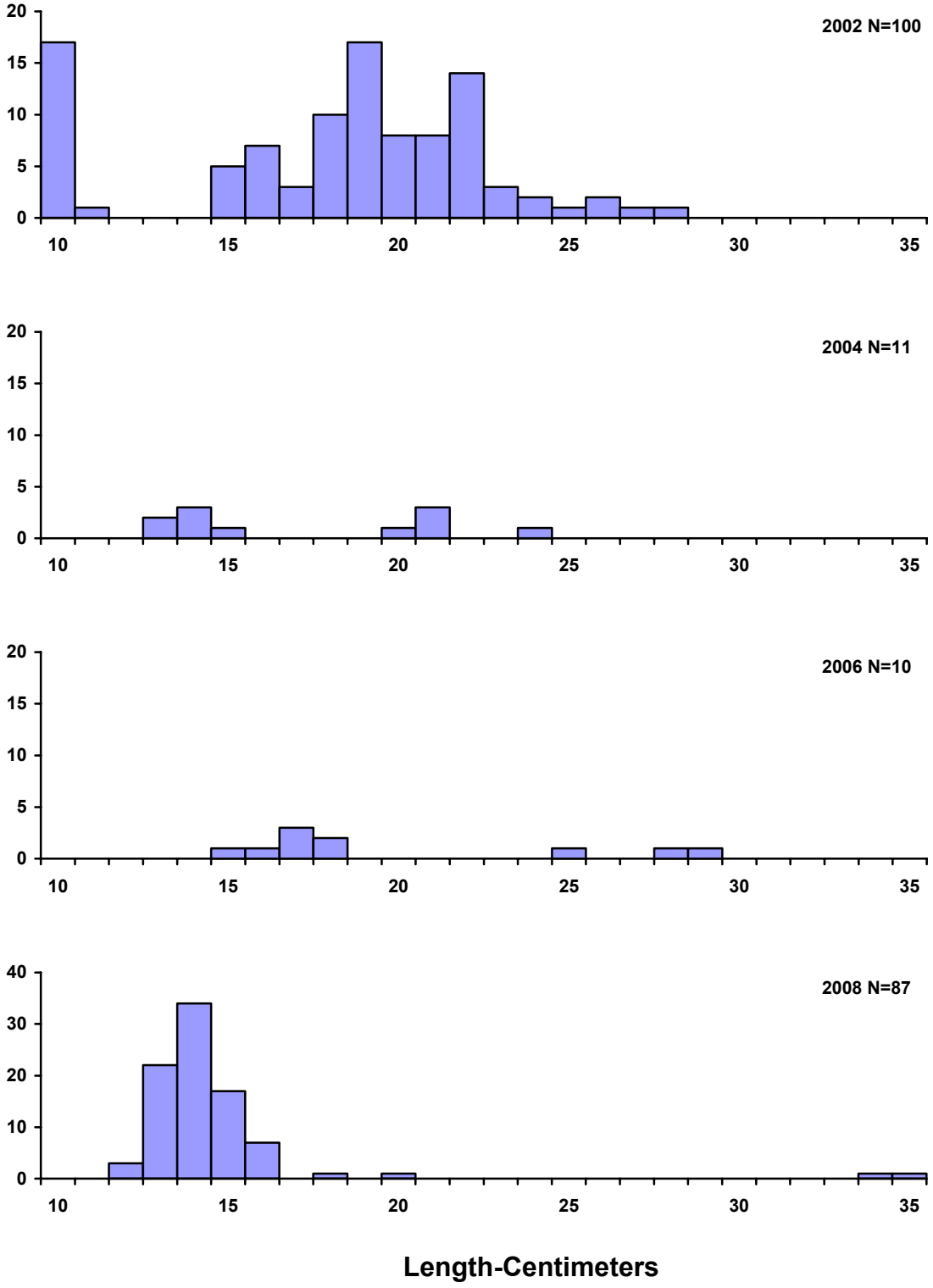


Figure 2. Length frequency histograms of yellow perch from Brush Lake, Brookings County, 2002, 2004, 2006 and 2008.

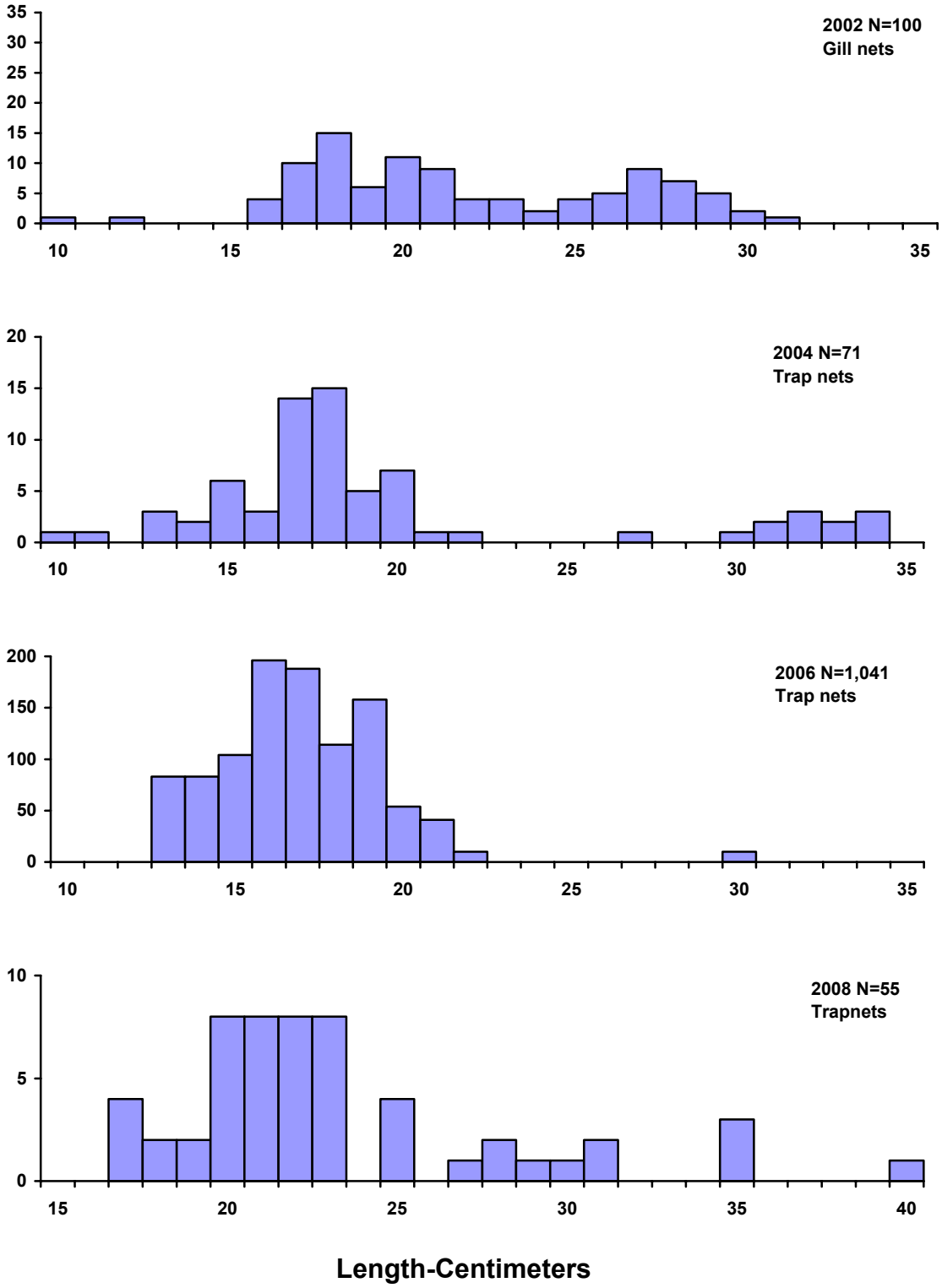
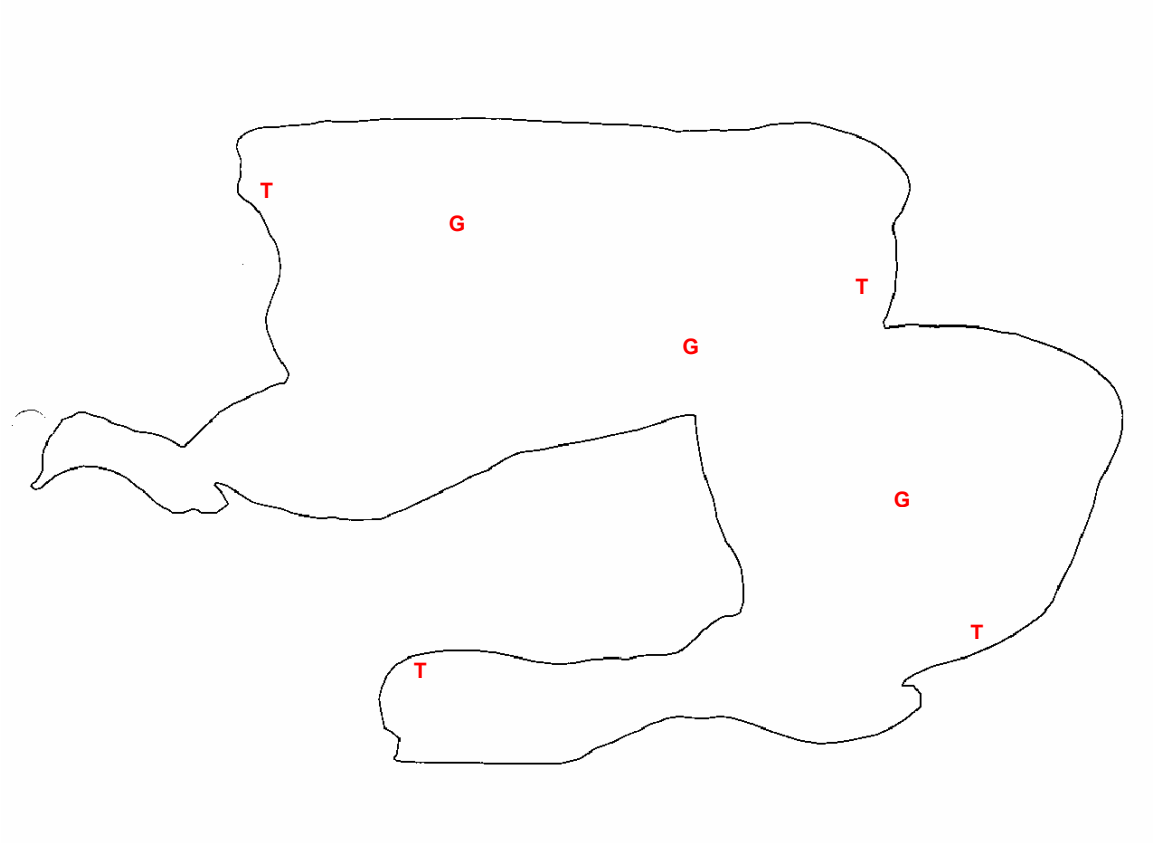


Figure 3 Length frequency histograms of black bullheads from Brush Lake, Brookings County, 2002, 2004, 2006 and 2008.



Legend Gill Net Sites: G
Trap Net Sites: T

Figure 4. Sampling locations on Brush Lake, Brookings County, 2008.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$PSD = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$RSD\text{-}P = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.